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ABSTRACT

FIVE BASIC ASSUMPTIONS UNDERLIE THE EFFECTIVE APPLICATION OF THE SYSTEMS APPROACH TO EDUCATIONAL MANAGEMENT: (1) THE PURPOSE OF AN EDUCATIONAL SYSTEM; (2) THE NEED FOR IMPROVEMENT IN THE EDUCATIONAL PROGRAMS OF THE 50 STATES; (3) THE COMPLEXITY OF LOCAL AND STATE EDUCATIONAL PROGRAMS; (4) THE PRESENT NONSYSTEMATIC MANAGEMENT OF MOST STATE, REGIONAL, AND LOCAL EDUCATIONAL PROGRAMS; AND (5) RECOGNITION OF THE NEED TO INVEST IN EDUCATIONAL SYSTEM ANALYSIS. FOLLOWING A SHORT-TERM SYSTEMS APPROACH, EXISTING EDUCATIONAL MANAGEMENT SYSTEMS MAY BE IMPROVED BY A SERIES OF 11 SPECIFIED STEPS. FOR THE LONG-TERM APPLICATION OF THE SYSTEMS APPROACH TO THE MANAGEMENT OF NATIONAL, STATE, AND LOCAL EDUCATIONAL SYSTEMS, MORE COMPREHENSIVE PLANNING IS REQUIRED. INFORMATION BEING DEVELOPED BY PROJECT CAPE, AN EXTENSIVE NATIONAL SURVEY ASSESSING EDUCATIONAL PROGRESS, COULD SERVE AS THE BACKGROUND FOR A NATIONAL EDUCATIONAL SYSTEM ANALYSIS, FOLLOWED BY SYSTEMS APPLICATIONS THAT WOULD BE REGIONAL IN SCOPE. A SEVEN-PHASE SYSTEM MODEL FOR PROGRAM DEVELOPMENT IS OUTLINED. (JK)

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MODIFING EXISTING MANAGEMENT SYSTEMS FOR USE IN EDUCATIONAL AGENCIES
or
How To Eat An Elephant

A presentation to the SYSTEMS 70 Conference
sponsored by the Space Division/North American Rockwell
November 13, 1969
Seal Beach, California
by Bruce Monroe
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In keeping with the theme of this conference; "management system requirements and system solutions for the next decade;" in order to analyze requirements of educational systems, it would be appropriate first to attempt to predict the nature of society during the coming decade in order to predict the type of individual the schools and colleges of this nation will need to be producing to further develop that society. Analysis of the types of educational programs needed to produce those individuals would then follow. Finally, the management needs of those programs would be determined. Since the first two steps have already been done in other publications I won't attempt to repeat them here, but will concentrate on the last two, educational program development, and management systems. Also in order to provide a context in which to organize these remarks and recommendations, I would like to state five assumptions about public and private education, educational systems and the management of educational systems. Following these, the specification of educational management system requirements, educational program areas needing improvement and finally two proposed procedures will be described.

Five Assumptions:

1. The first assumption concerns the purpose of an educational system. The Constitution delegates to the States, responsibility for an educational program to guide and support regional and local efforts in providing schools to maximize the development of the individuals experiencing the school's programs. Development of the individual includes attitudinal, emotional and interpersonal development as well as intellectual skills and the physical well-being of the student. Schools exist to produce rationale, responsible, effective citizens. A recent emphasis has been to plan educational programs in such a way that every student, regardless of his so-called ability, interest, background, home or income, succeeds in his school experience.

2. A second assumption is that the educational programs of the 50 States, our protectorates and territories are amenable to improvement. By their own statements and by review of students' reactions to school, it is clear that there are changes to be made. 750,000 youth a year drop out. Suicide among students is twice that of out of school youth of the same age and similar in

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other respects. Forty types of educational malpractice have been documented and suits have been filed for damages by parents. Manpower training programs this year found 30,000 functional illiterates with high school diplomas in one review. In a society in which the knowledge explosion has exceeded the ability of anyone to keep enough factual information in his head, to perform successfully in our society, the traditional school program based on "telling" and "remembering" is no longer relevant.

The two social institutions most like schools are monastaries and penal institutions. The monastary, penal institution model previously appropriate is no longer functional. Schoolmen talk about developing a new types of school programs, new schedules, new staffing patterns and new ways of teaching.

3. A third assumption is that the local and state educational programs (for many reasons) are unusually complex enterprises (as are other forms of public service). Providing successful, worthwhile experiences for millions of children from all walks of life for up to nine hours a day, 200 days a year is a large-scale, complex, expensive operation.

4. Another assumption. Although statewide, regional and local programs are called "systems," they operate (for the most part) in nonsystematic fashion. Their management is too often responsive to public pressures and daily problems, rather than being forward looking and comprehensive. They have outmoded organizational plans. Little in the way of modern management systems has been applied to operation of the state educational efforts and the local districts programs.

In the last ten years however, some attempts have been made to apply system management techniques to public and private educational efforts. In November, 1967, the United States Office of Education called the first national conference on System Analysis in The Educational Environment. Since that time approximately five hundred education projects around the country have attempted (in one aspect of operation or another) to apply system analysis, operations research and system development techniques. However, in no case to date has this been done in a comprehensive, wide-scale, thorough fashion across an entire educational endeavor, as has been recommended by system analysts.

In other forms of public service; (transportation, housing, law enforcement, public health and welfare) experience indicates that operations research, system analysis and development and research and development techniques (as a system approach is variously called) have been applied with benefits to public service enterprises. Savings in time, money and increases in efficiency and satisfaction have been documented in instances where system analysis has been applied.

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To quote Dr. Leon Lessinger, Associate Commissioner of the U.S. Office of Education, "In the same way that planning, market studies, research and development, and performance warranties determine industrial production and its worth to consumers, so should we be able to engineer, organize, refine, and manage the educational system to prepare students to contribute to the most complex and exciting country on earth."

5. A final assumption is that an investment in educational system analysis and development would bring a guaranteed return to tax payers. Documentation of the United States Chamber of Commerce cites an annual loss of over $600 million dollars to personal income and the gross national product as the result of the lost earning power of 3/4 of a million dropouts.

   To apply system management practices and system analysis and development techniques to education; nationwide, statewide and regionally is an enterprise of a large order of magnitude, to use an analogy, approximately equal to eating an elephant single-handedly. However, what evidence there is indicates it would be justified (in terms of the returns to the individual and the economy), to invest up to 600 million dollars a year in this effort. One percent of the yearly budget for education equals $500 million, and any corporate board of directors would recommend an investment in research and development of over 1%.

   The final assumption, in summary is that the educational enterprise needs to begin investing more heavily in applying system analysis and development procedures and particularly management systems.

   What then would be the requirements of such educational management systems?

Requirements for an Educational Management System

To be of maximum usefullness and adaptable to the wide variations of practice in educational agencies, an educational management system must ~~be~~ at least:

- o insure an adequate flow of information to the learner as well as to decision-makers affecting what the learner will experience,
- o increase the visibility of learning progress to the learner, parents and school staff,
- o heighten the shared accountability for learning progress among parents, the learner and the school staff,
- o have minimum response times between learner diagnosis and the learning prescription,
- o make cost-effectiveness proposals about alternative courses of action,

- o interface approximately twelve other public information systems including the local library, the Department of Labor job bank, the Educational Research Information Centers, the Instructional Objectives Exchange and others,

- o facilitiate individualization of the curriculum and instruction,

- o speak a language that young children can understand,

- o make multi-variate probability statements about alternative courses of action for the learner,

- o be at least regional in scope to allow regional program emphasis to be modified,

- o account for the influence of home, peer group and other social agencies on learning progress,

- o be sufficently standardized in language to allow transfer of learners from school to school and region to region,

- o emphasize problem solving skills and learning ability not the acquisition of factual information.

Now then, to what areas of educational programs could these educational management systems be most profitably applied?

Like any complex endeavor, certain aspects of the operation of an educational program are more efficient than others. Below are two lists indicating well managed and less well managed program functions:

<u>Typically Efficiently Managed</u>:

- o ensuring physical welfare and safety of student
- o transporting students
- o attendance accounting
- o scheduling students and teachers for group activities
- o dispensing instructional information
- o maintaining facilities
- o recording and reporting operational information
- o fiscal accounting and payroll
- o purchasing and warehousing
- o devoting personal staff time

Needing Management Improvement:

- o comprehensive planning
- o specifying student and program performance objectives
- o routine, thorough diagnosis of student
- o measuring student and program accomplishments
- o reallocating budgets by program
- o comparing cost/effectiveness
- o monitoring and evaluating staff productivity
- o individualizing or modifying curriculum and instruction
- o ensuring quality of product
- o analyzing wider range of program alternatives
- o accessing student data profiles
- o allocating appropriate resources in instruction
- o matching student schedule to needs
- o providing relevant parent and public information

It is recommended that educators responsible for the above needy functions capitalize upon management systems developed in the operational programs and the research and development procedures of the aerospace, communication and other scientific industries.

Existing systems and procedures would then be adapted to the unique requirements of educational programs.

The obvious next question then is, "How do you proceed to eat an elephant?" A friend tells me you do it by, "taking one bite at a time."

The remaining remarks will describe two procedures, (one short term and one long term) which I propose as a reasonable first bite and an long term procedure for eating the whole elephant. What I will propose first is rigorous application (on a national, state, regional and local basis) of management systems technology, and eventually a system analysis and development of the national educational enterprise at a cost of approximately 60 million dollars of investment per year for the next ten years.

Taking The First Bite; A Short-Term Approach to Redeveloping Educational Systems: Adapting Existing Management Systems to Educational Systems

The following steps represent the major milestones in a procedure to adapt an existing management system (of the appropriate scope and complexity) to an educational program.

1. Review the long range and intermediate objectives of the program in operational terms.

2. Analyze functions and tasks required to accomplish the objectives.

3. Separate management functions from total functions.

4. Rank order management functions in terms of complexity and difficulty to perform.

5. Review management procedures now in use or available for use.

6. Assess and allocate internal capability to carry out selected management functions.

7. Locate additional capability, contract for services as required.

8. Vary selected parameters of existing systems to accommodate the specific management functions.

9. Create new procedures as appropriate.

10. Plan phased change-over from existing procedures.

11. Assess system and sub system functions and modify as necessary to point of diminished return.

A word of caution, however, about the above procedure. As experienced educators are painfully aware, the commitment to invest in a change process must premeate the entire environment before the change process can hope to succeed.

<u>A Long Term Application of Operations Research, System Analysis and System Development to the Development of National, State and Local Education Systems</u>:

In the last three years a national program has come into existence as a result of the funding of Congress and foundations interested in education. The project is entitled CAPE, the Committee on Assessing the Progress of Education and has recently has been absorbed as a project by the Educational Commission of the States (the ECS). The ECS is a non-profit organization with 43 member states with a membership of governors, chief state school officers, legislators and others concerned about education. The current budget of CAPE is 2 1/2 million dollars and the 1970 budget is projected at $4 million. The procedure for assessing the progress of education in the United States consists of sampling students from 700 schools chosen to be representative of all the schools in the United States. Using samples of students of approximately 20 to 30 thousand, student achievement is measured in the areas of citizenship, science, writing, math, music, literature, ect. in three year cycles. The results of student achievement are summarized regionally (rather by state or local districts) so that there can be no comparisons possible between specific district or schools. Pre-school and out of school youth are assessed as well as in-school age youth.

The proposal herein suggests that this information be used as background information to begin a <u>national systems analysis</u> of selected areas of school functioning, those that CAPE finds to be less successful.

Since the CAPE project is currently being carried on by the Educational Commission of the States, it might well be appropriate to organize through that agency eight regional analyses of educational needs. If that organization found it inappropriate, another suitable psuedo-governmental, non-profit public agency would be utilized to act as policy maker and program manager of this effort, much as NASA coordinates the Space Program.

How the program might proceed would be as follows. As CAPE indicates regional variations in the effectiveness of school programs to teach certain subject matter, those programs that are found to be least successful in any region would be the target of comprehensive system analysis within that region. Assuming there was some persistant problem areas (for instance, reading) in several regions; a cooperative task force made up of system analysts from several regions could analyze and suggest modifications in reading practices within that total area. In time, by pooling the results of these system analyses (conducted in the separate regions) a comprehensive analysis of the entire educational effort in the Nation and the States would be accomplished. This could be done in approximately a three to four year time period.

Regional Development of Education Solutions

Assuming a thorough-going system analysis of the sort that made the Moon Program successful, a concentrated development phase would then be appropriate. Utilizing the existing (or certain of the existing) regional educational laboratories and bolstering their capability with additional resource from foundations, private industry, the arts and sciences; educational systems would be evolved, developed, field tested, implemented broadly, monitored and improved over time. Such a development phase could reasonably require several years and hundreds of millions of dollars.

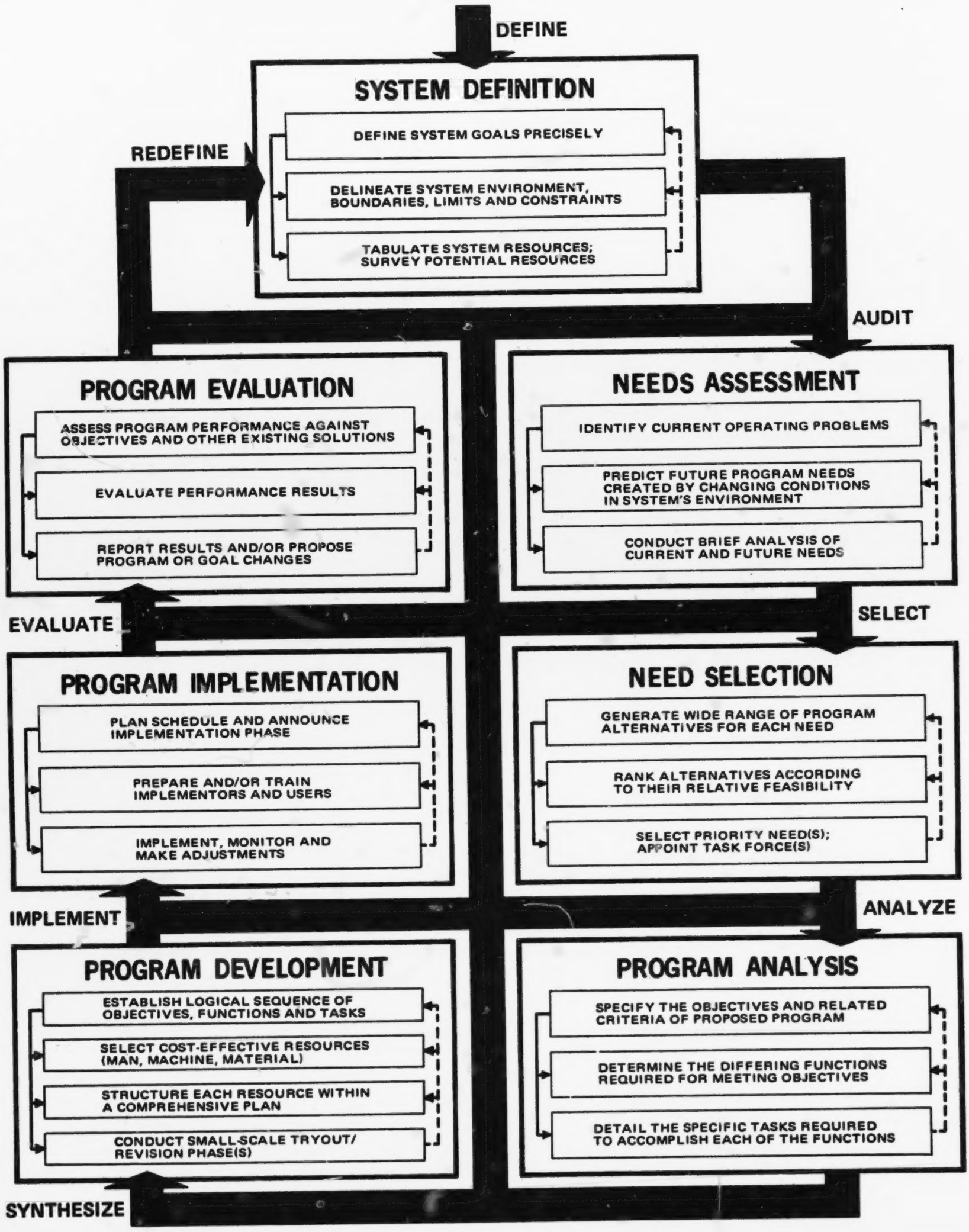
The model for system development within the regional efforts would follow a typical system analysis and development model of the sort attached.

Concern obviously needs to be given (at all points in this process) to ensure that local districts not lose autonomy and were given opportunity to modify the basic program to meet local requirements. What is not being proposed is a national curriculum with a standardized educational program such as is typical in certain European countries; rather a national effort in system analysis and development which would make available a range of alternatives a highly reliable, educational system among which local and regional programs would originally choose and subsequently modify. Using the elephant analogy again, there are lots of ways to eat an elephant and local districts would be encouraged to choose those ways which are most comfortable, with proviso that they eat the entire elephant and within a reasonable period of time.

The mass media today is full of pronouncements by educators and others concerned with education about the need for accountability and guaranteed performance in education. It is reasonable to assume that while education can become accountable

to the same extent that other public service agencies are accountable, it is also reasonable to offer them the experience and services of other large complex organizations that have been over similar ground previously to help avoid reinventing the wheel. It is in that frame of reference that these proposals are offered. Private industry, foundation-supported research and development and other public service agencies have proven their ability to perform successfully in equally large, complex, problematic enterprises. As consumer of the educational product of the national educational effort and as tax payers who support it (if not as parents, uncles, grandparents and neighbors)-we have a responsibility and a right to demand sound educational management.

A SYSTEM MODEL FOR PROGRAM DEVELOPMENT


DEFINE
SYSTEM DEFINITION
DEFINE SYSTEM GOALS PRECISELY
DELINEATE SYSTEM ENVIRONMENT, BOUNDARIES, LIMITS AND CONSTRAINTS
TABULATE SYSTEM RESOURCES; SURVEY POTENTIAL RESOURCES
REDEFINE
AUDIT
PROGRAM EVALUATION
ASSESS PROGRAM PERFORMANCE AGAINST OBJECTIVES AND OTHER EXISTING SOLUTIONS
EVALUATE PERFORMANCE RESULTS
REPORT RESULTS AND/OR PROPOSE PROGRAM OR GOAL CHANGES
NEEDS ASSESSMENT
IDENTIFY CURRENT OPERATING PROBLEMS
PREDICT FUTURE PROGRAM NEEDS CREATED BY CHANGING CONDITIONS IN SYSTEM'S ENVIRONMENT
CONDUCT BRIEF ANALYSIS OF CURRENT AND FUTURE NEEDS
EVALUATE
SELECT
PROGRAM IMPLEMENTATION
PLAN SCHEDULE AND ANNOUNCE IMPLEMENTATION PHASE
PREPARE AND/OR TRAIN IMPLEMENTORS AND USERS
IMPLEMENT, MONITOR AND MAKE ADJUSTMENTS
NEED SELECTION
GENERATE WIDE RANGE OF PROGRAM ALTERNATIVES FOR EACH NEED
RANK ALTERNATIVES ACCORDING TO THEIR RELATIVE FEASIBILITY
SELECT PRIORITY NEED(S); APPOINT TASK FORCE(S)
IMPLEMENT
ANALYZE
PROGRAM DEVELOPMENT
ESTABLISH LOGICAL SEQUENCE OF OBJECTIVES, FUNCTIONS AND TASKS
SELECT COST-EFFECTIVE RESOURCES (MAN, MACHINE, MATERIAL)
STRUCTURE EACH RESOURCE WITHIN A COMPREHENSIVE PLAN
CONDUCT SMALL-SCALE TRYOUT/ REVISION PHASE(S)
PROGRAM ANALYSIS
SPECIFY THE OBJECTIVES AND RELATED CRITERIA OF PROPOSED PROGRAM
DETERMINE THE DIFFERING FUNCTIONS REQUIRED FOR MEETING OBJECTIVES
DETAIL THE SPECIFIC TASKS REQUIRED TO ACCOMPLISH EACH OF THE FUNCTIONS
SYNTHESIZE

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